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STANDARDIZATION OF POWER SYSTEMS 10-100KW

NUMBER OF COMPONENT PART NUMBERS REDUCED 67%
GROSS PROFIT MARGIN INCREASED BY 17 PERCENTAGE POINTS

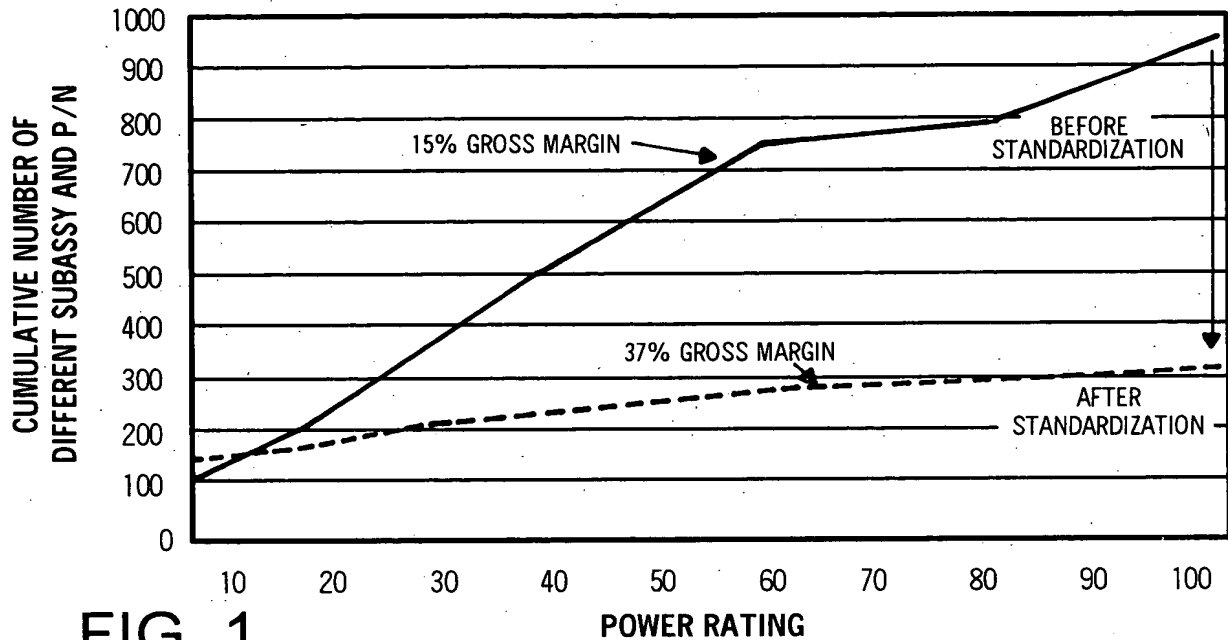


FIG. 1

Economic Profit \$ (ROIC-WACC) vs Number of Products Product in Order of Descending ROIC%

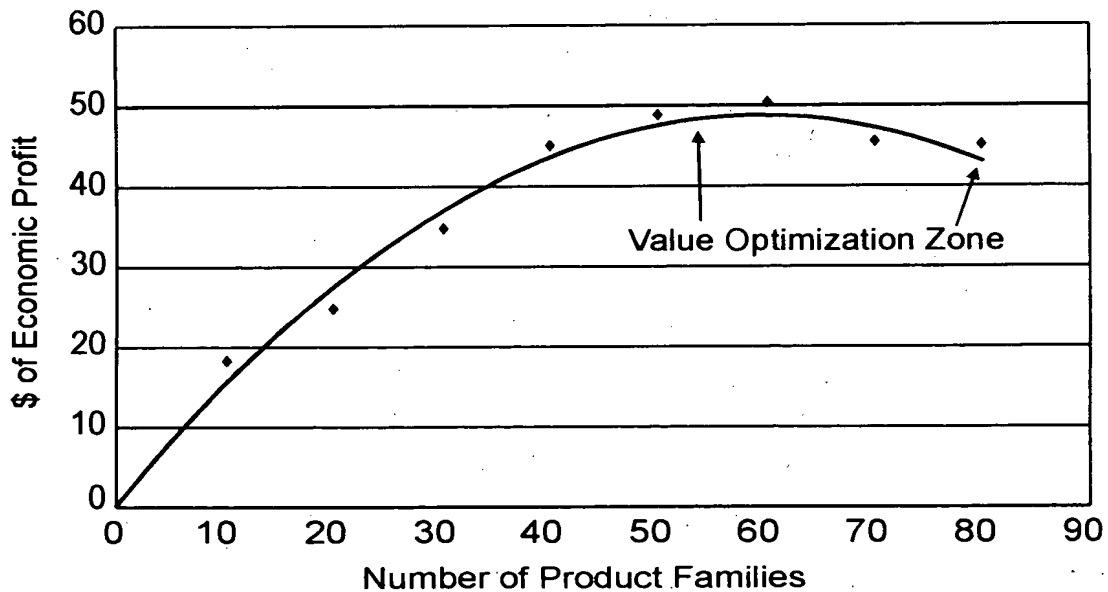


FIG. 2

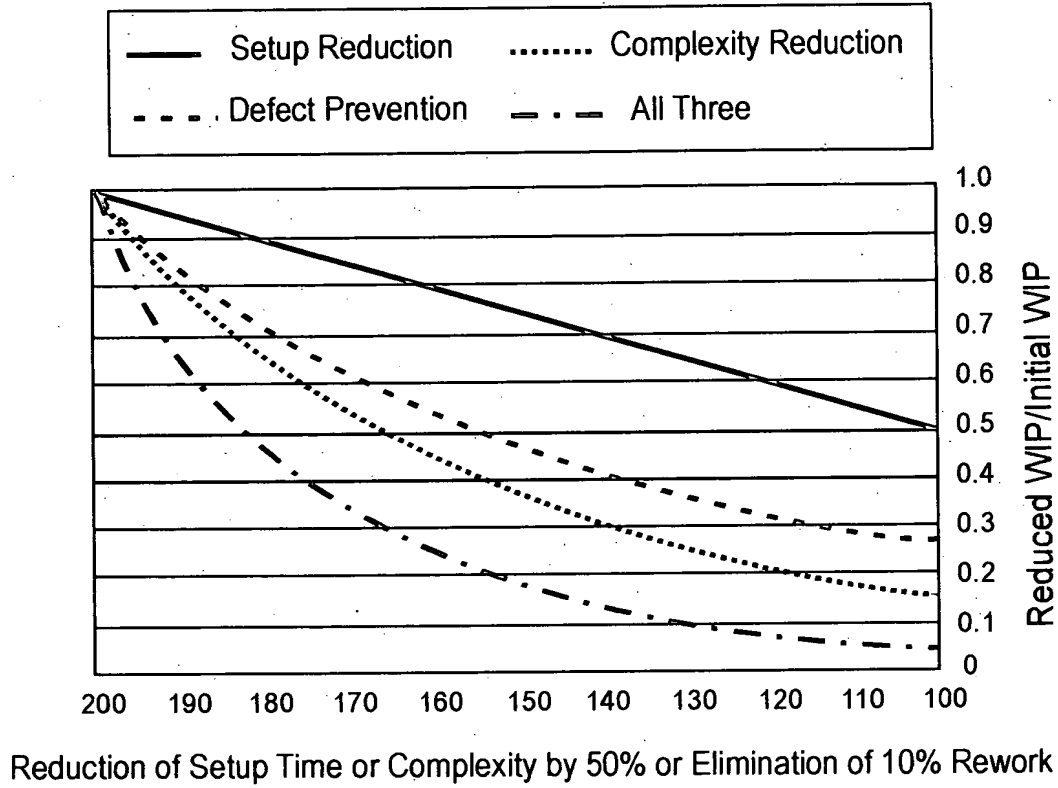


FIG. 3

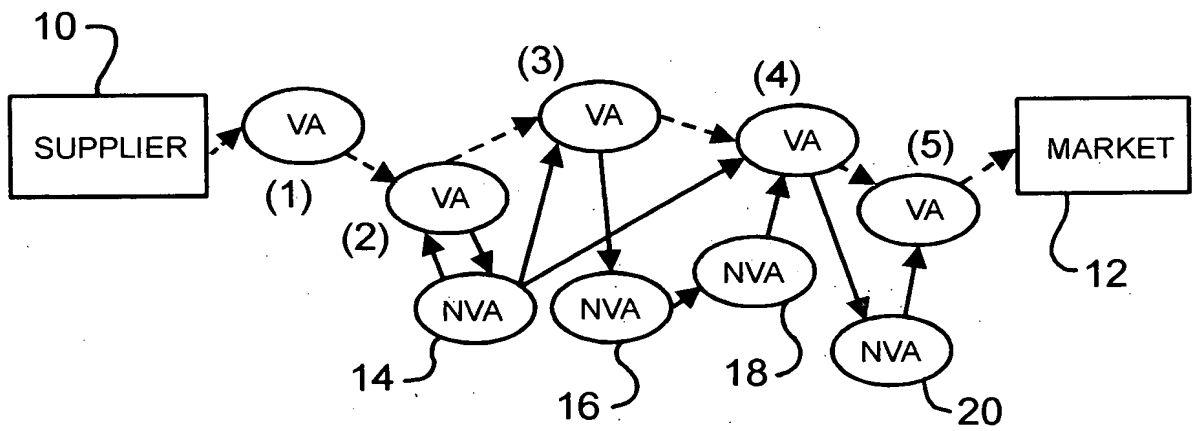


FIG. 4

Cost of Goods Sold % of Revenue vs. Adjusted WIP Turns

$$\text{Adj WIP Turns} = [(W/W_0)/(\text{COGS}_0/\text{COGS})]$$

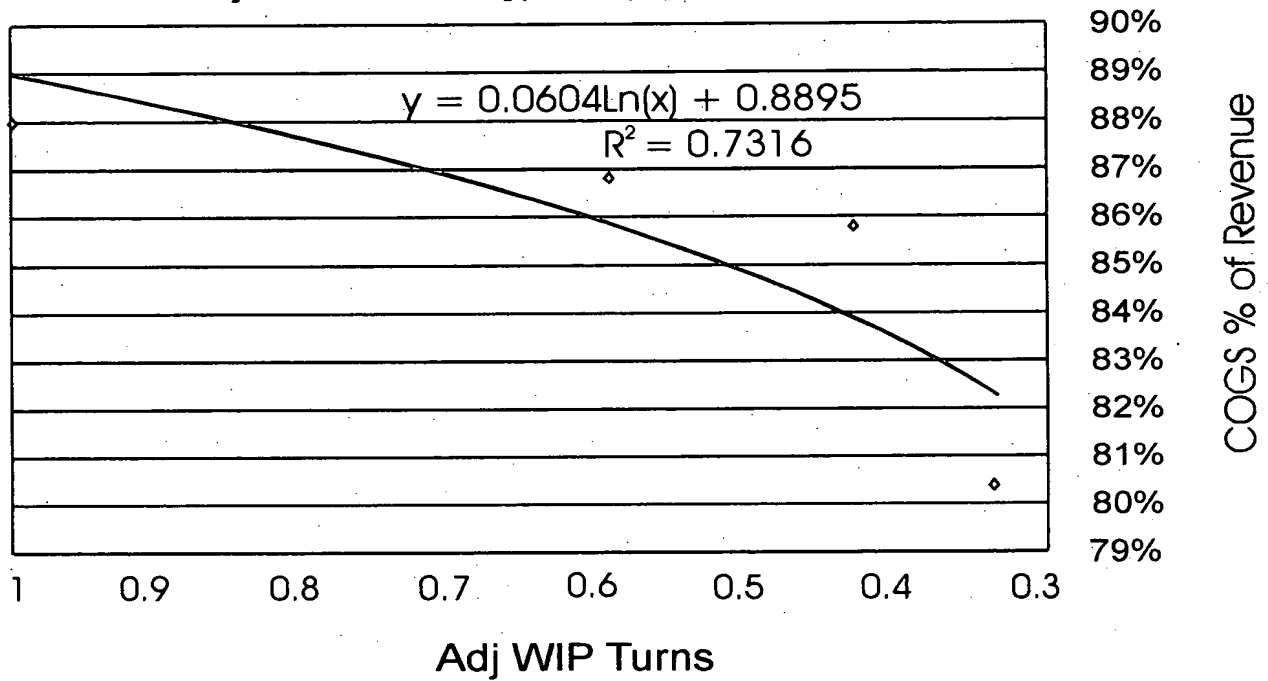


FIG. 5



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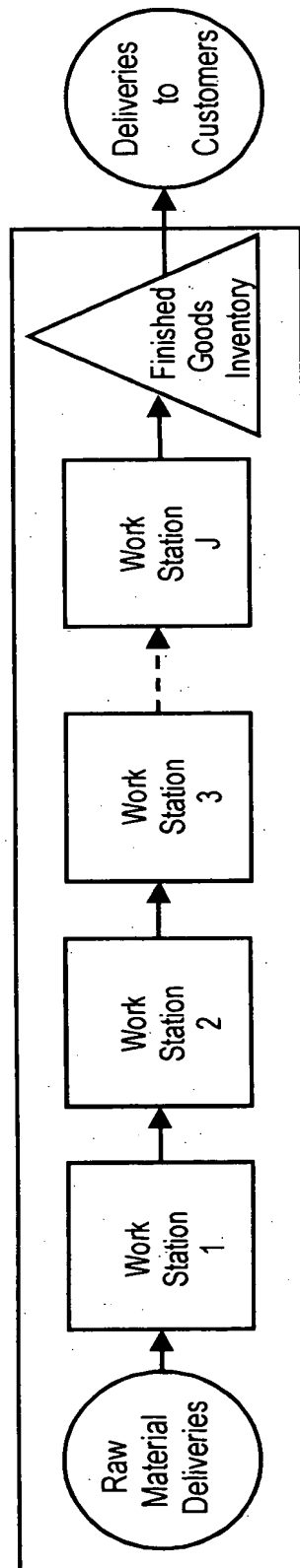
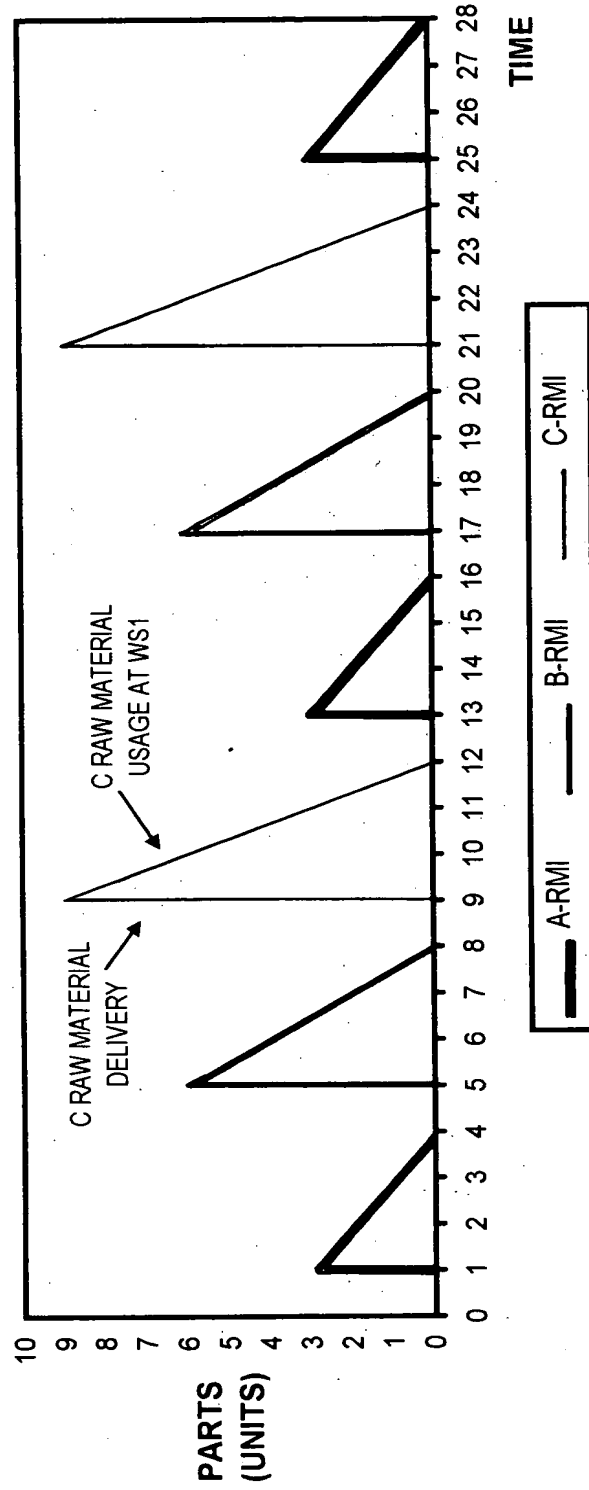


FIG. 7

From	To		WS1	WS2	WS3
0	1		SA	PC	PB
1	2		PA	PC	PB
2	3		PA	PC	SC
3	4	One Workstation Turnover Cycle for Station 1	PA	SA	PC
4	5		SB	PA	PC
5	6		PB	PA	PC
6	7		PB	PA	SA
7	8		PB	SB	PA
8	9		SC	PB	PA
9	10		PC	PB	PA
10	11		PC	PB	SB
11	12		PC	SC	PB
12	13		SA	PC	PB
13	14		PA	PC	PB
14	15		PA	PC	SC
15	16	One Workstation Turnover Cycle for Station 3	PA	SA	PC
16	17		SB	PA	PC
17	18		PB	PA	PC
18	19		PB	PA	SA
19	20		PB	SB	PA
20	21		SC	PB	PA
21	22		PC	PB	PA
22	23		PC	PB	SB
23	24		PC	SC	PB
24	25		SA	PC	PB
25	26		PA	PC	PB
26	27		PA	PC	SC
27	28		PA	SA	PC
28	29		SB	PA	PC
29	30		PB	PA	PC
30	31		PB	PA	SA
31	32		PB	SB	PA

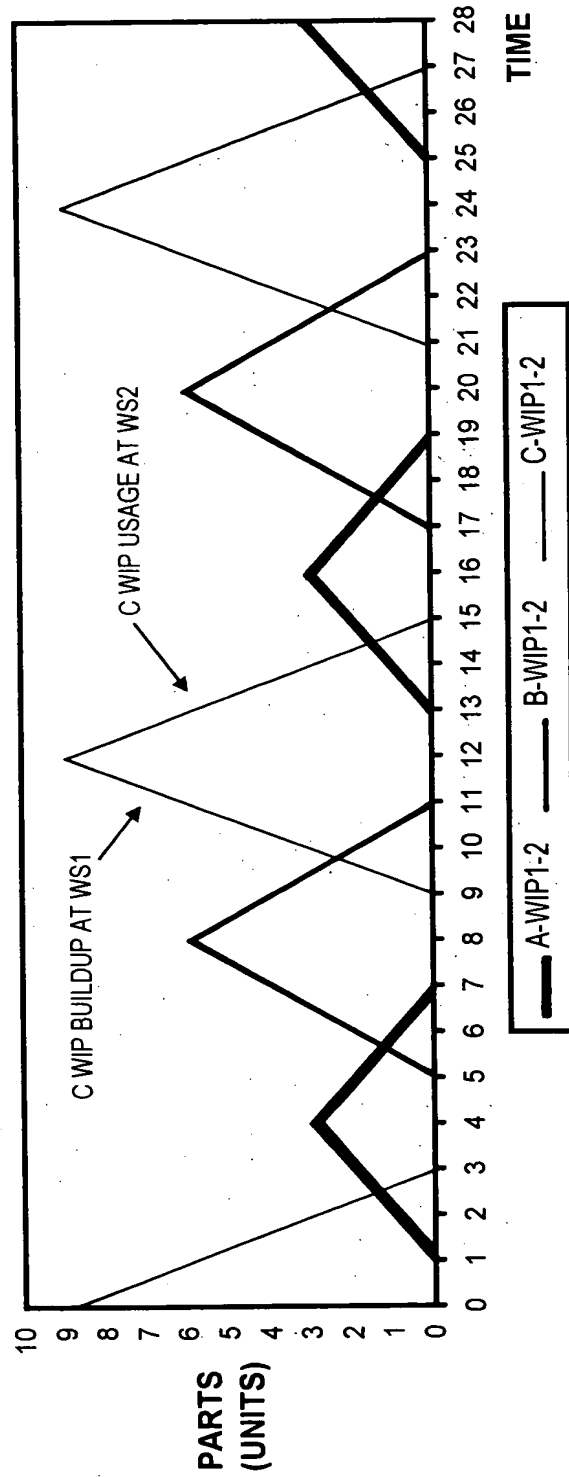
Perfectly Synchronized Production Schedule

FIG. 8



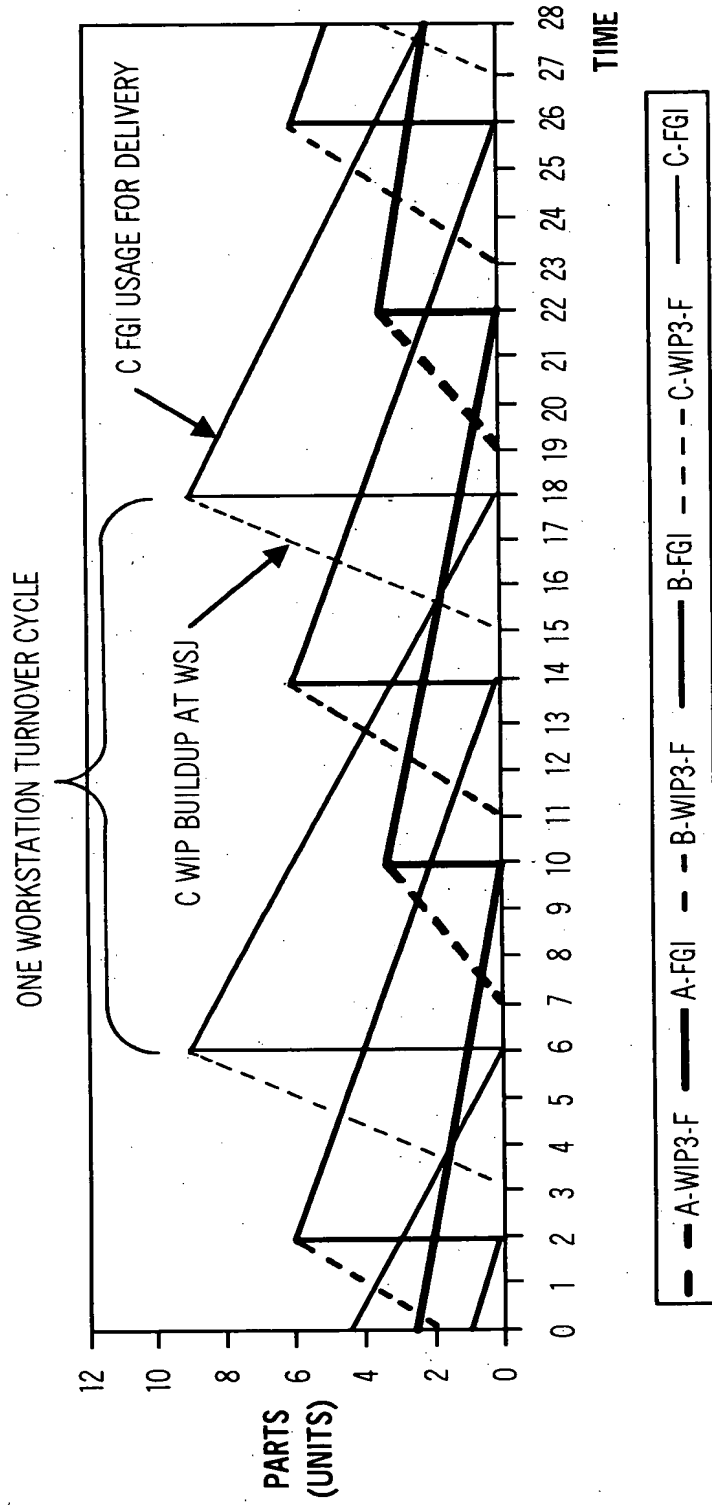
RAW MATERIAL INVENTORY IN FRONT OF THE FIRST STATION, SYNCHRONIZED PRODUCTION

FIG. 9



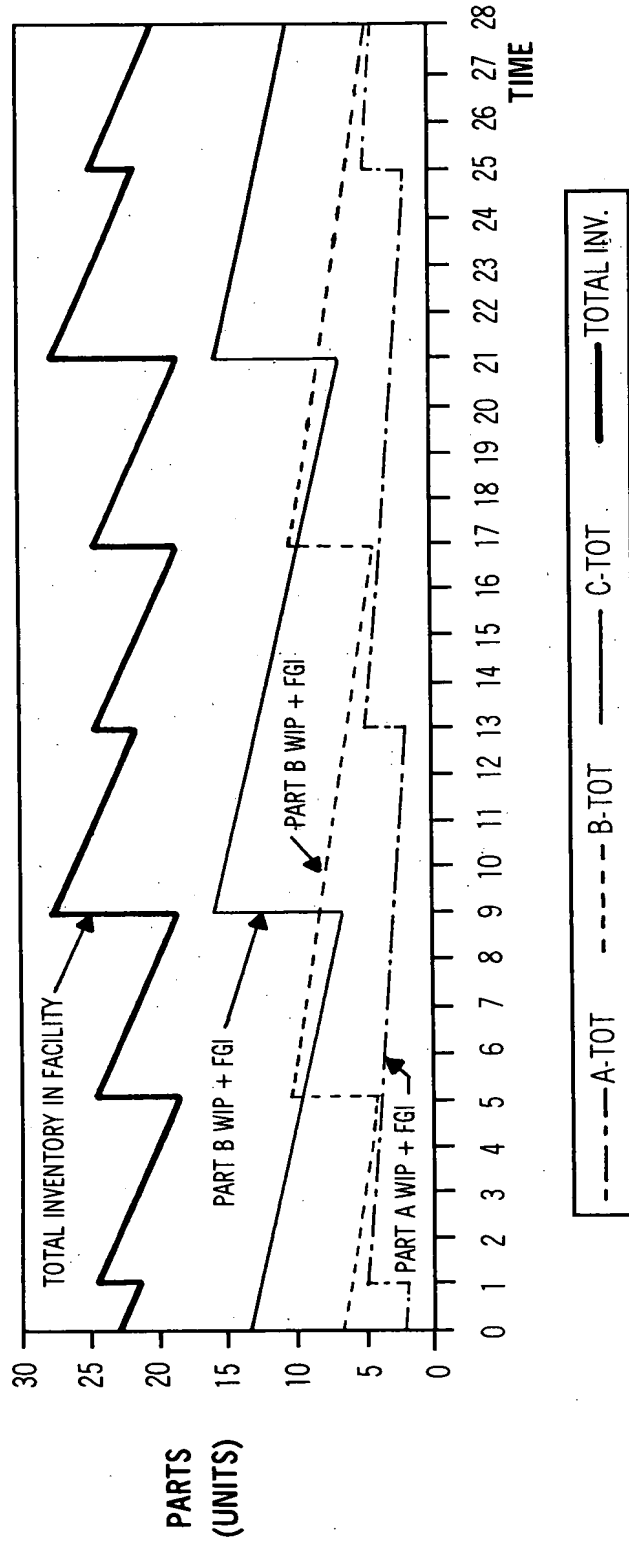
WORK IN PROCESS INVENTORY BETWEEN STATIONS 1 AND 2, SYNCHRONIZED PRODUCTION

FIG. 10



FINISHED GOODS INVENTORY, SYNCHRONIZED PRODUCTION

FIG. 11



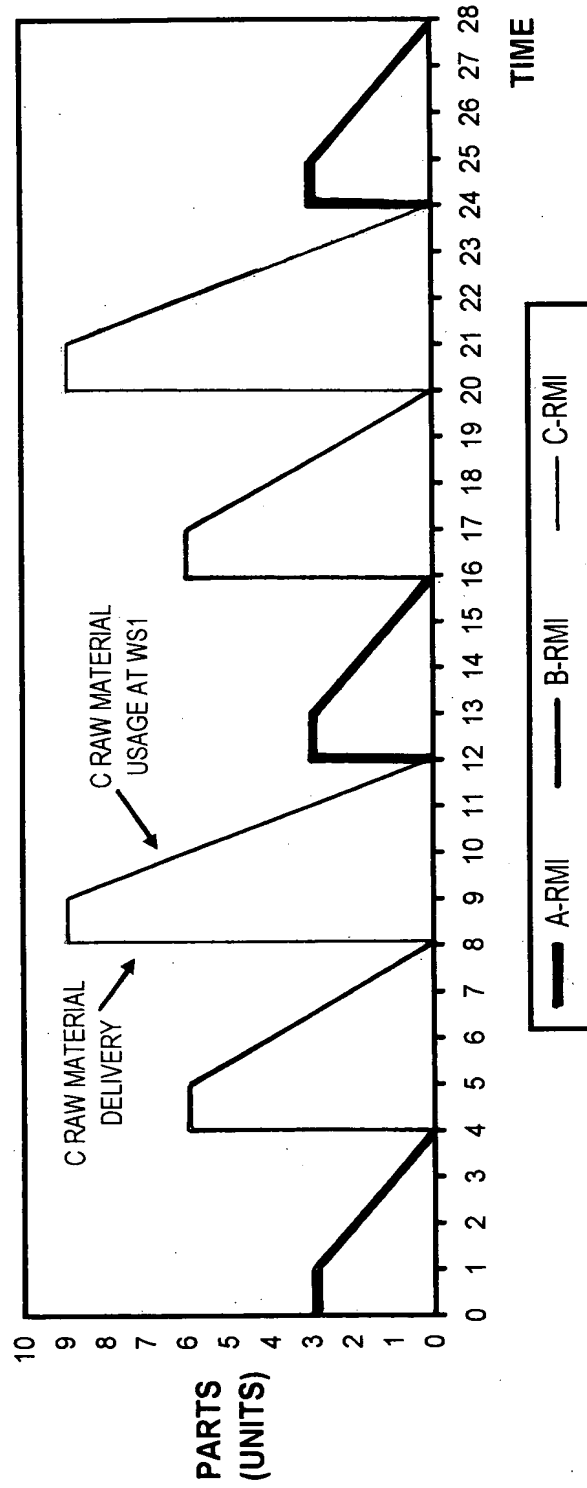
AGGREGATE INVENTORY LEVELS, SYNCHRONIZED PRODUCTION

FIG. 12

From	To		WS1	WS2	WS3
0	1	One Workstation Turnover Cycle for Station 1	SA	SC	SB
1	2		PA	PC	PB
2	3		PA	PC	PB
3	4		PA	PC	PB
4	5		SB	SA	SC
5	6		PB	PA	PC
6	7		PB	PA	PC
7	8		PB	PA	PC
8	9		SC	SB	SA
9	10		PC	PB	PA
10	11		PC	PB	PA
11	12		PC	PB	PA
12	13	One Workstation Turnover Cycle for Station 3	SA	SC	SB
13	14		PA	PC	PB
14	15		PA	PC	PB
15	16		PA	PC	PB
16	17		SB	SA	SC
17	18		PB	PA	PC
18	19		PB	PA	PC
19	20		PB	PA	PC
20	21		SC	SB	SA
21	22		PC	PB	PA
22	23		PC	PB	PA
23	24		PC	PB	PA
24	25		SA	SC	SB
25	26		PA	PC	PB
26	27		PA	PC	PB
27	28		PA	PC	PB
28	29		SB	SA	SC
29	30		PB	PA	PC
30	31		PB	PA	PC
31	32		PB	PA	PC

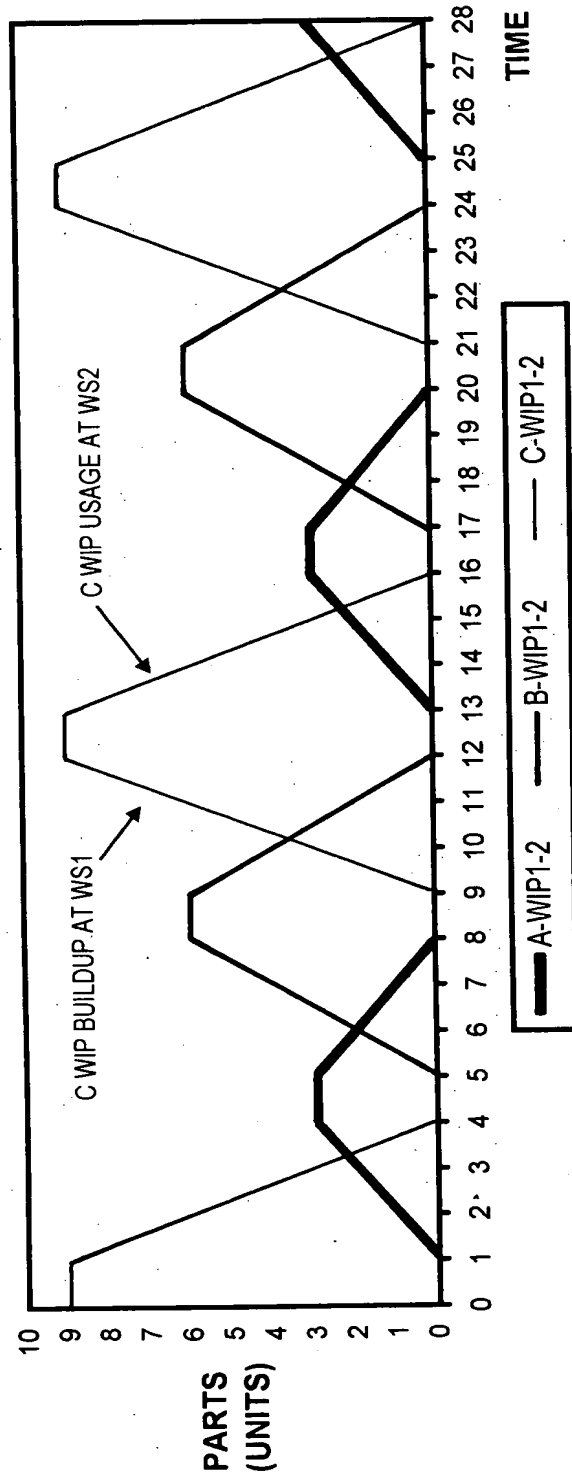
Setup-On-Batch-Arrival Production Schedule

FIG. 13



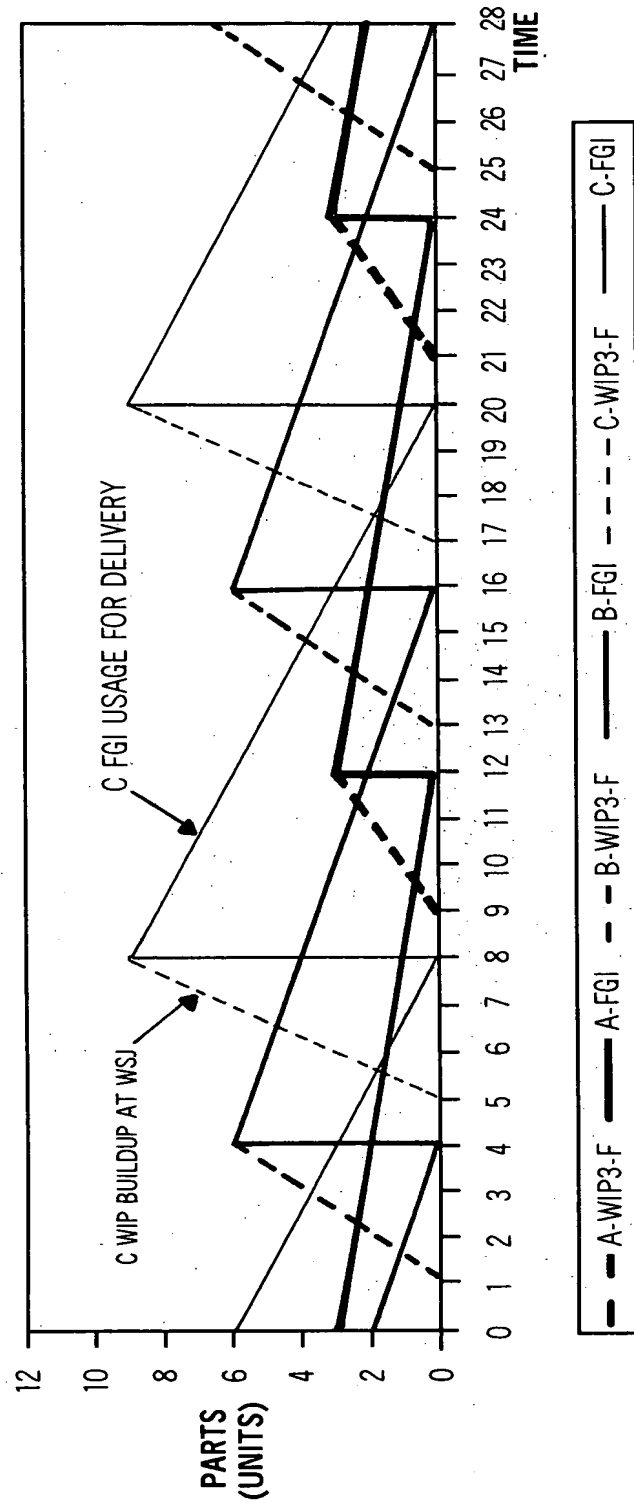
RAW MATERIAL INVENTORY IN FRONT OF THE FIRST STATION, SETUP-ON-BATCH-ARRIVAL SCHEDULE

FIG. 14



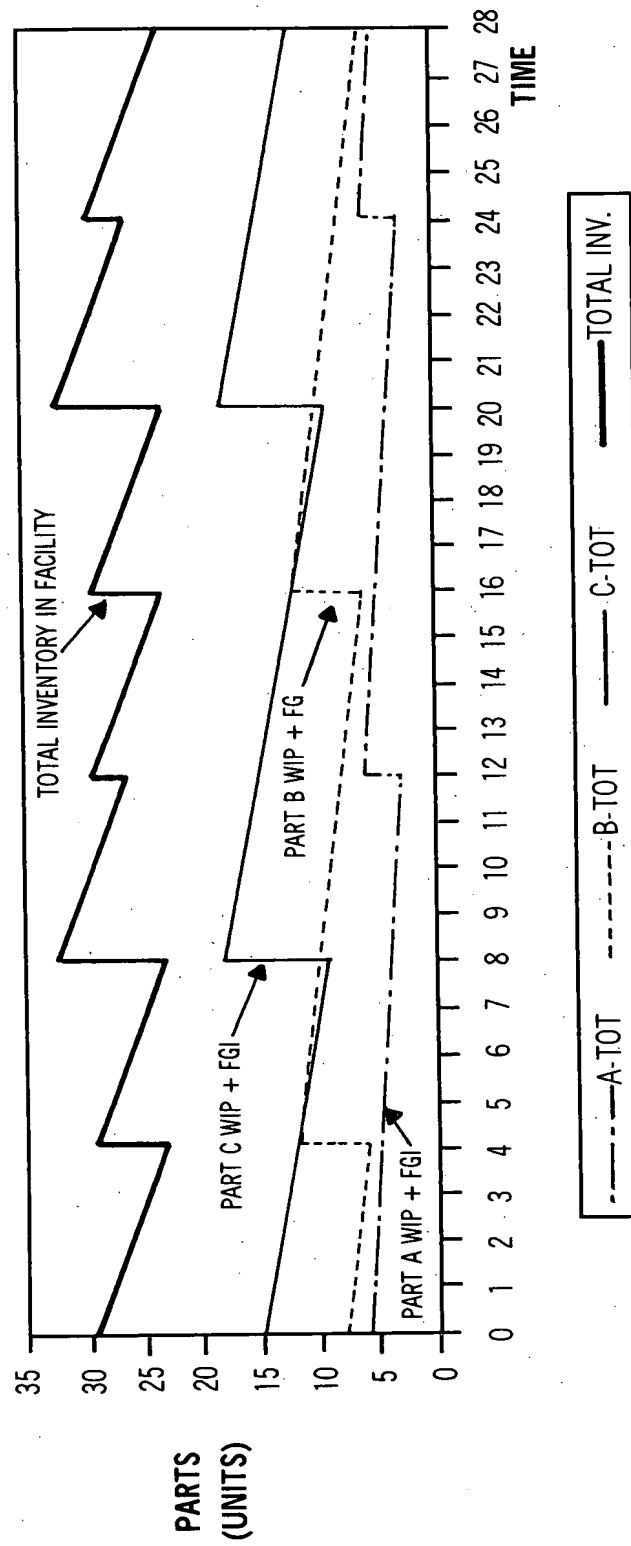
WORK IN PROCESS INVENTORY BETWEEN STATIONS 1 AND 2, SETUP-ON-BATCH-ARRIVAL SCHEDULE

FIG. 15



FINISHED GOODS INVENTORY, SETUP-ON-BATCH-ARRIVAL SCHEDULE

FIG. 16



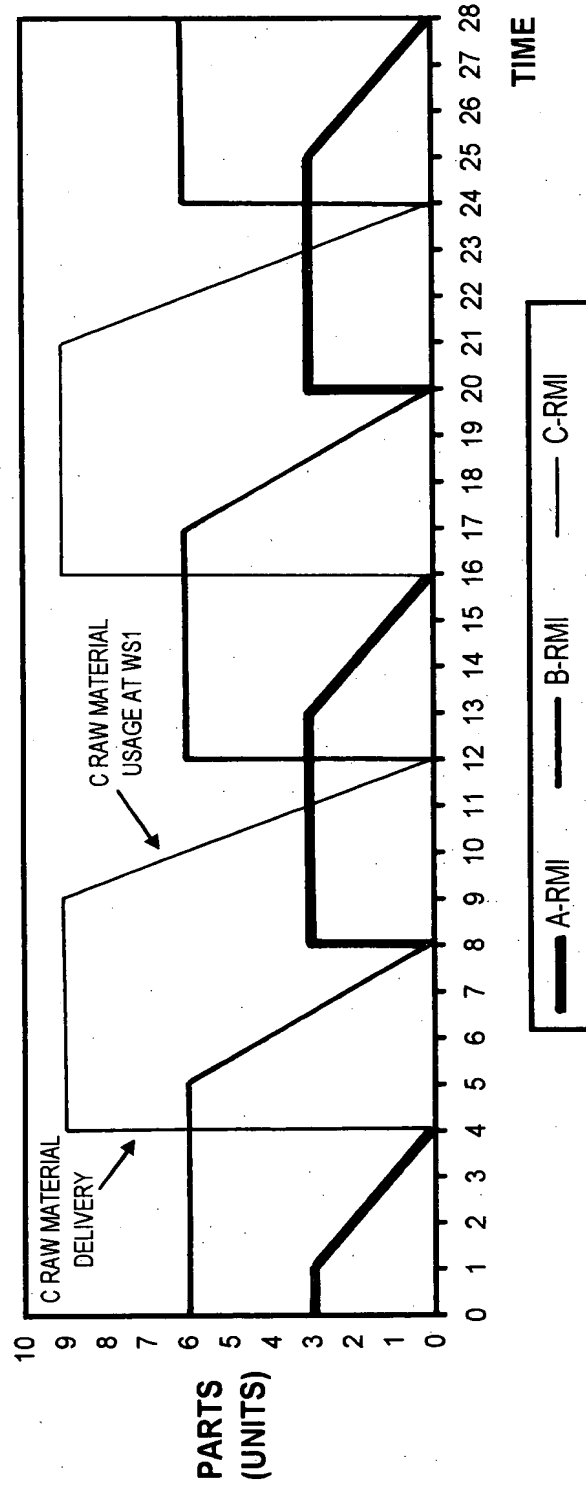
AGGREGATE INVENTORY LEVELS, SETUP-ON-BATCH-ARRIVAL SCHEDULE

FIG. 17

From	To		WS1	WS2	WS3
0	1	One Workstation Turnover Cycle for Station 1	SA	SB	SC
1	2		PA	PB	PC
2	3		PA	PB	PC
3	4		PA	PB	PC
4	5		SB	SC	SA
5	6		PB	PC	PA
6	7		PB	PC	PA
7	8		PB	PC	PA
8	9		SC	SA	SB
9	10		PC	PA	PB
10	11		PC	PA	PB
11	12		PC	PA	PB
12	13	One Workstation Turnover Cycle for Station 3	SA	SB	SC
13	14		PA	PB	PC
14	15		PA	PB	PC
15	16		PA	PB	PC
16	17		SB	SC	SA
17	18		PB	PC	PA
18	19		PB	PC	PA
19	20		PB	PC	PA
20	21		SC	SA	SB
21	22		PC	PA	PB
22	23		PC	PA	PB
23	24		PC	PA	PB
24	25		SA	SB	SC
25	26		PA	PB	PC
26	27		PA	PB	PC
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28	29		SB	SC	SA
29	30		PB	PC	PA
30	31		PB	PC	PA
31	32		PB	PC	PA

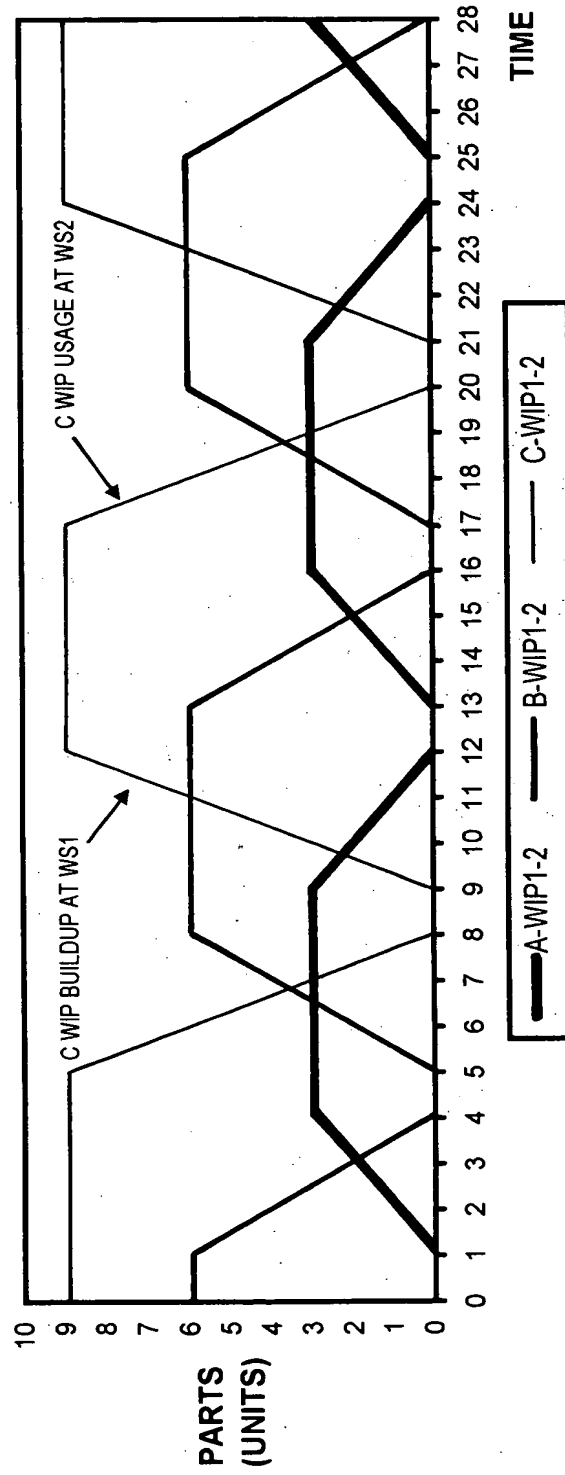
Moderately Asynchronized Production Schedule

FIG. 18



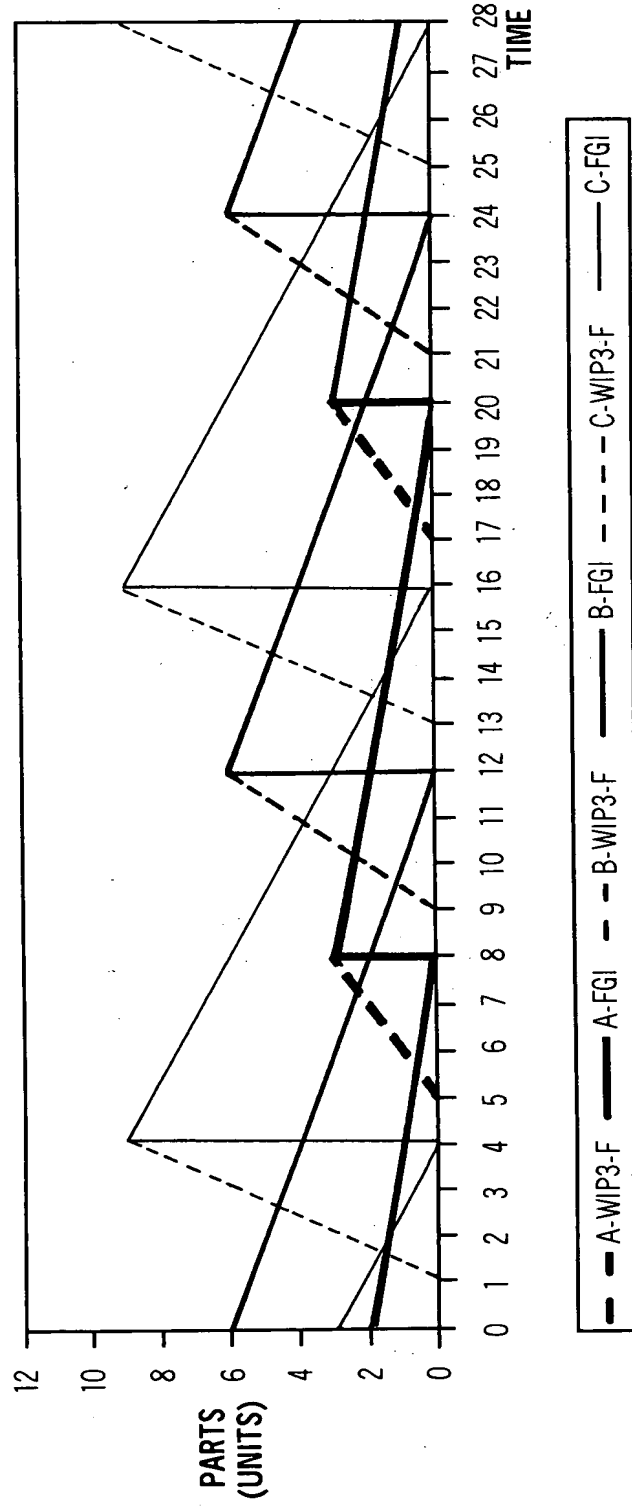
RAW MATERIAL INVENTORY IN FRONT OF THE FIRST STATION, MODERATELY ASYNCHRONIZED SCHEDULE

FIG. 19



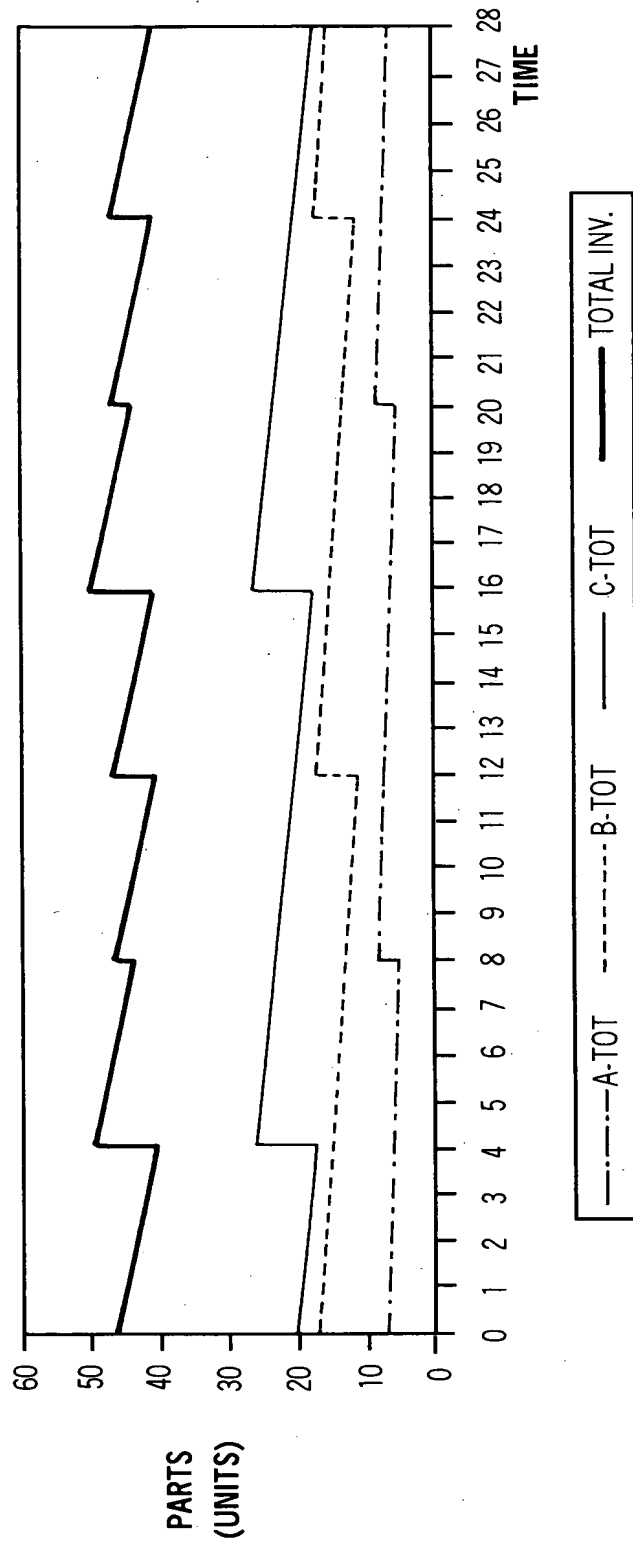
WORK IN PROCESS INVENTORY BETWEEN STATIONS 1 AND 2, MODERATELY ASYNCHRONIZED SCHEDULE

FIG. 20



FINISHED GOODS INVENTORY, MODERATELY ASYNCHRONIZED SCHEDULE

FIG. 21



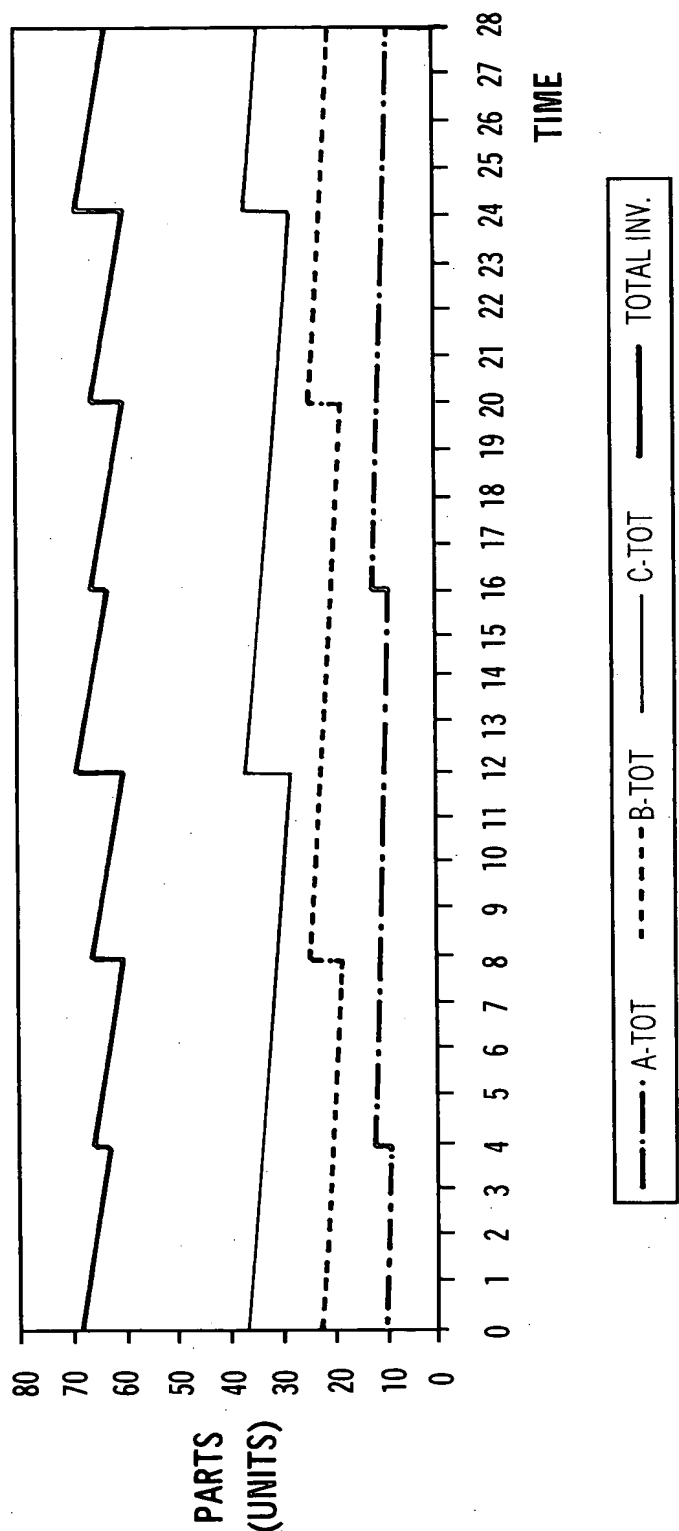
AGGREGATE INVENTORY LEVELS, MODERATELY ASYNCHRONIZED SCHEDULE

FIG. 22

From	To		WS1	WS2	WS3
0	1	One Workstation Turnover Cycle for all Stations	SA	SA	SA
1	2		PA	PA	PA
2	3		PA	PA	PA
3	4		PA	PA	PA
4	5		SB	SB	SB
5	6		PB	PB	PB
6	7		PB	PB	PB
7	8		PB	PB	PB
8	9		SC	SC	SC
9	10		PC	PC	PC
10	11		PC	PC	PC
11	12		PC	PC	PC
12	13		SA	SA	SA
13	14		PA	PA	PA
14	15		PA	PA	PA
15	16		PA	PA	PA
16	17		SB	SB	SB
17	18		PB	PB	PB
18	19		PB	PB	PB
19	20		PB	PB	PB
20	21		SC	SC	SC
21	22		PC	PC	PC
22	23		PC	PC	PC
23	24		PC	PC	PC
24	25		SA	SA	SA
25	26		PA	PA	PA
26	27		PA	PA	PA
27	28		PA	PA	PA
28	29		SB	SB	SB
29	30		PB	PB	PB
30	31		PB	PB	PB
31	32		PB	PB	PB

Fully Asynchronized Production Schedule

FIG. 23



AGGREGATE INVENTORY LEVELS, FULLY ASYNCHRONIZED SCHEDULE

FIG. 24

Schedule Case	Minimum Aggregate Inventory	Maximum Aggregate Inventory
1. Perfectly Synchronized	18.5	27.5
2. Setup-on-Batch-Arrival	23.0	32.0
3. Moderately Asynchronized	41.0	50.0
4. Fully Asynchronized	59.0	68.0

Comparison of Aggregate Inventory Levels

FIG. 25

Total Average WIP Calculations

		Number of Fast Movers					
		2	3	4	5	6	7
Number of Slow Movers	0	1000	1500	2000	2500	3000	3500
	1	1164	1695	2220	2741	3259	3776
	2	1341	1903	2452	2994	3530	4062
	3	1530	2123	2695	3257	3812	4359
	4	1731	2352	2950	3531	4102	4666
	5	1945	2595	3215	3818	4405	4983
	6	2171	2849	3491	4112	4716	5309
	7	2410	3114	3779	4417	5038	5646
	8	2659	3391	4078	4734	5370	5990
	9	2922	3680	4387	5062	5712	6346
	10	3200	3980	4710	5400	6065	
	11	3483	4292	5039	5747		
	12	3781	4614	5380			
	13	4092	4948				
	14	4414					

Total Average WIP for the Complex Facility

FIG. 26

Total Average WIP Calculations (cont.)

		Number of Fast Movers							
		8	9	10	11	12	13	14	15
Number of Slow Movers	0	4000	4500	5000	5500	6000	6500	7000	7500
	1	4291	4803	5316	5826	6336	6846	7356	7863
	2	4591	5117	5641	6163	6683	7203	7720	
	3	4902	5441	5976	6509	7040	7567		
	4	5222	5774	6320	6864	7404			
	5	5553	6115	6673	7228				
	6	5891	6467	7035					
	7	6239	6826						
	8	6600							
	9								
	10								
	11								
	12								
	13								
	14								

FIG. 27

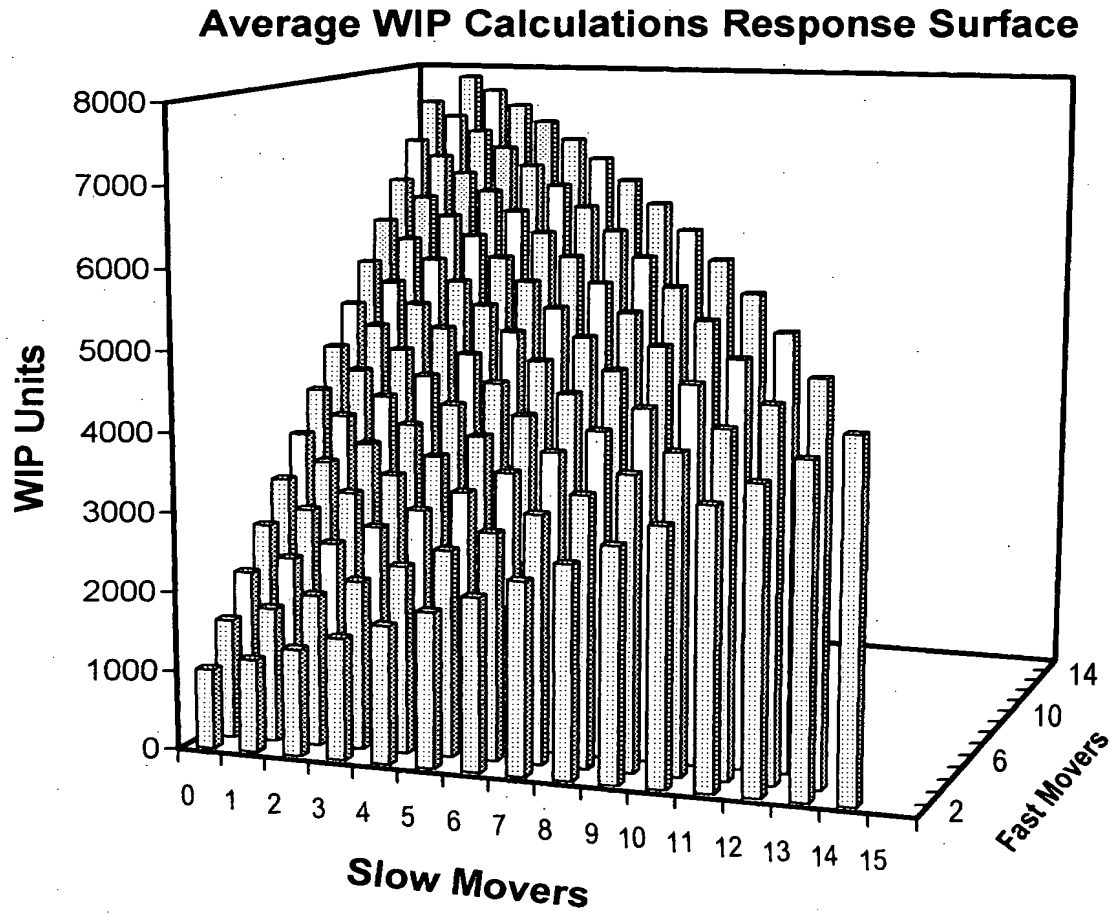
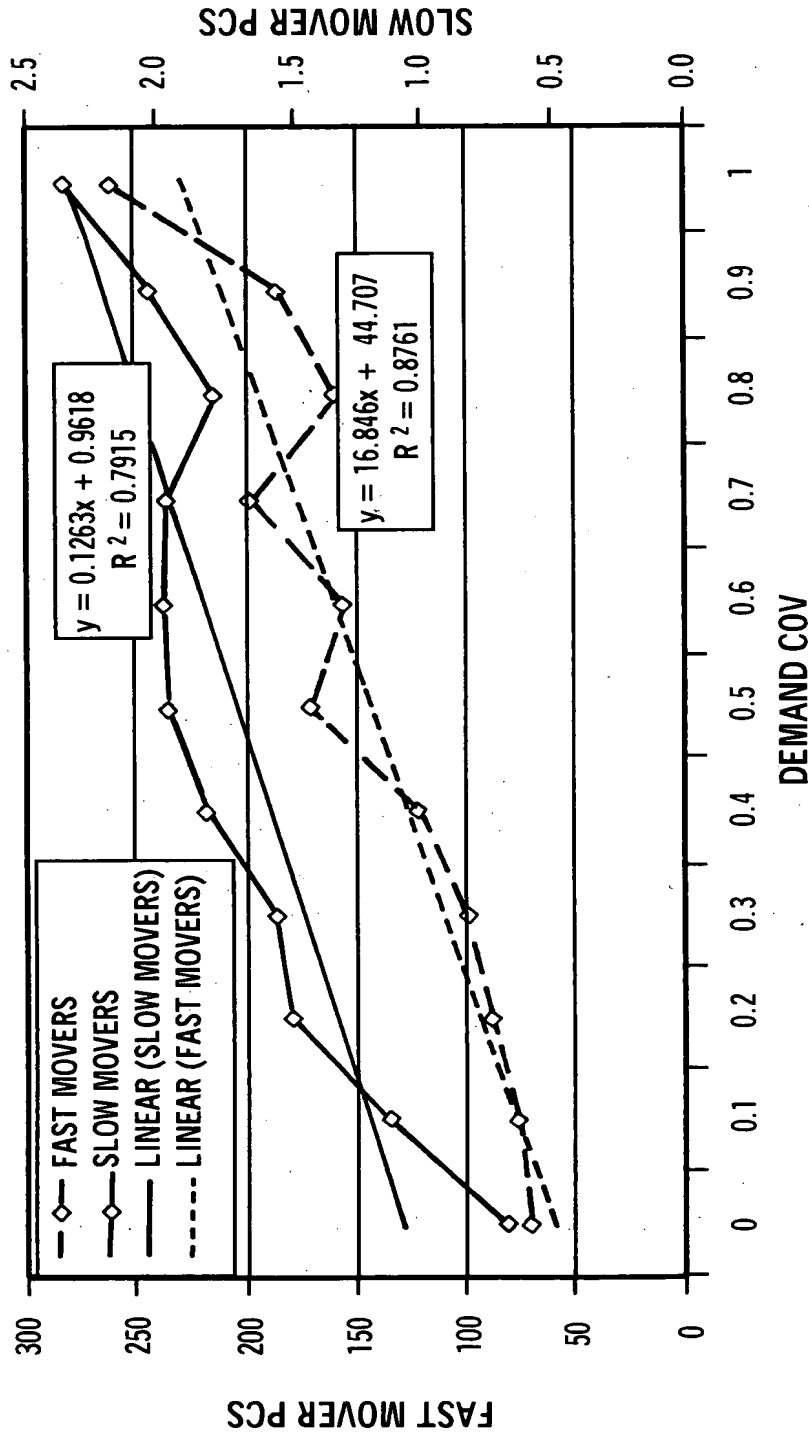


FIG. 28

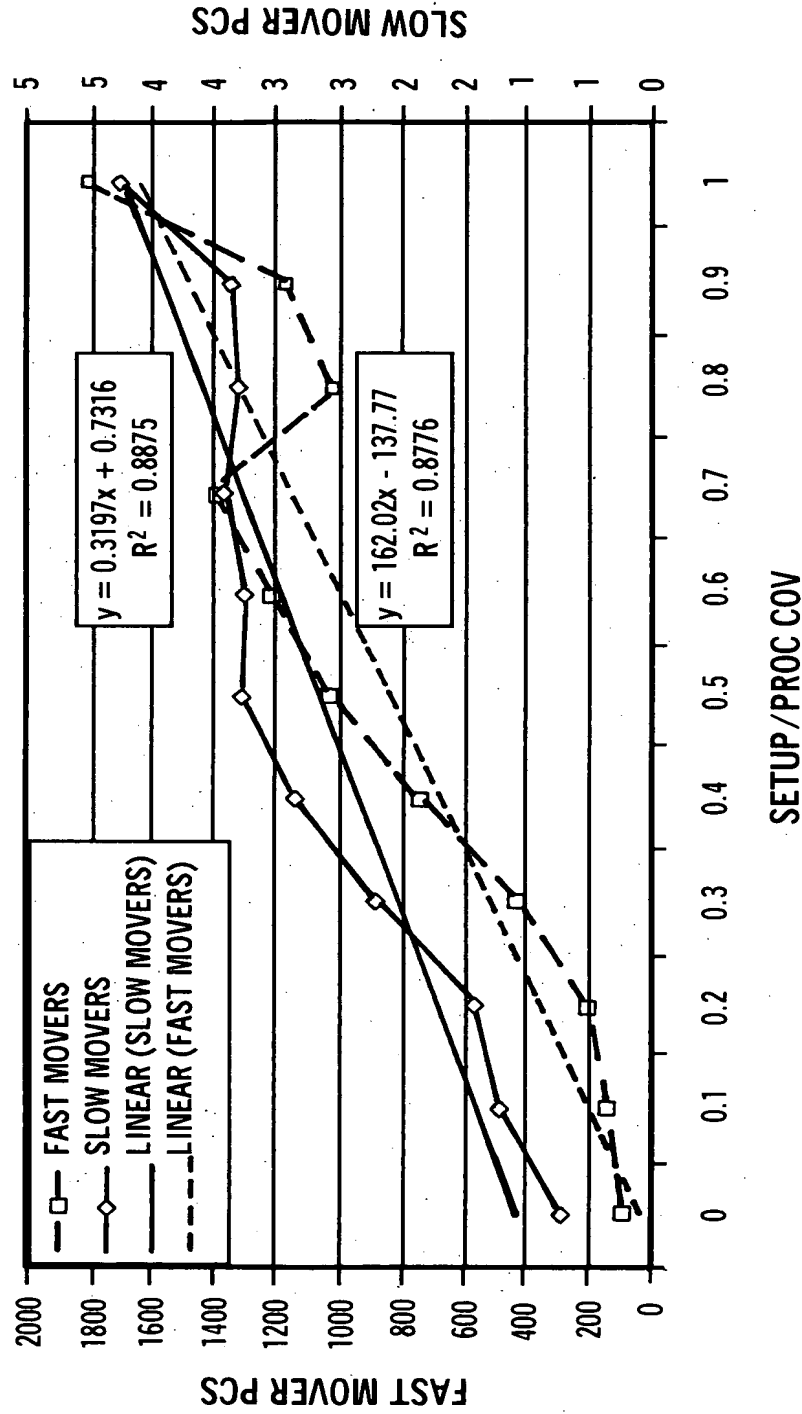
BACKLOG AVERAGE AT 100% UTILIZATION, 3 FAST, 2 SLOW PARTS



AVERAGE BACKLOG WITH DEMAND VARIATION

FIG. 29

BACKLOG AVERAGE AT 100% UTILIZATION, 3 FAST, 2 SLOW PARTS



AVERAGE BACKLOG WITH SETUP/PROCESSING VARIATION

FIG. 30

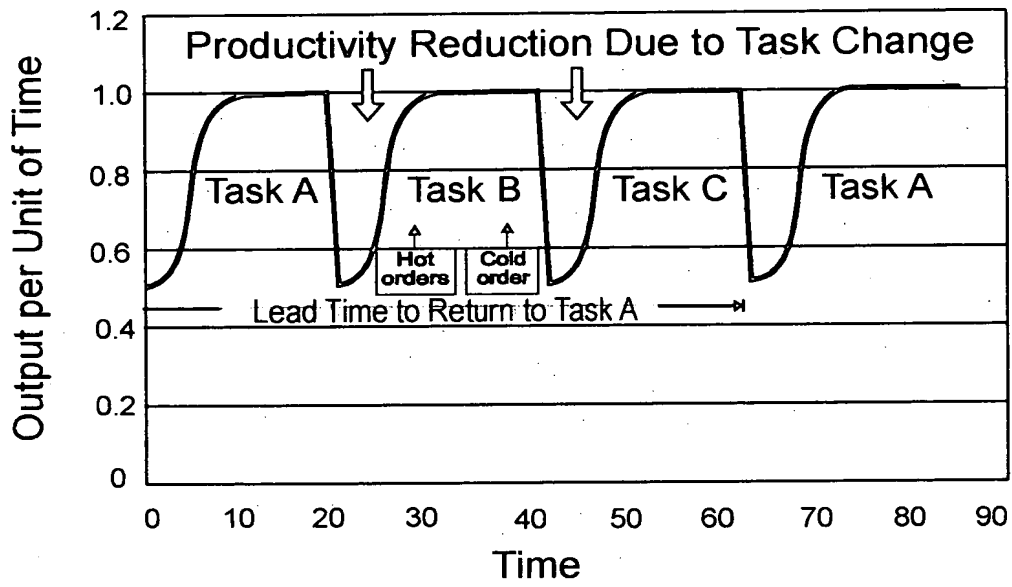


FIG. 31